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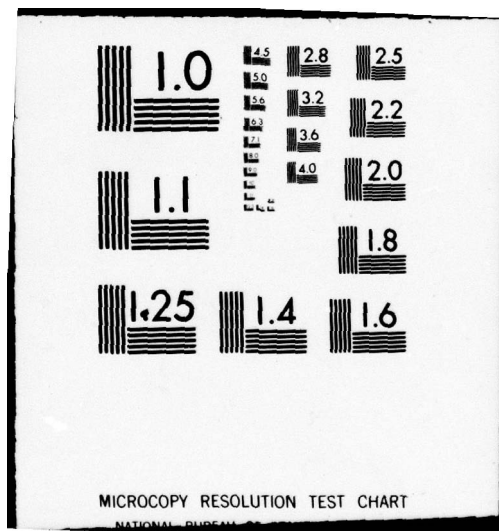
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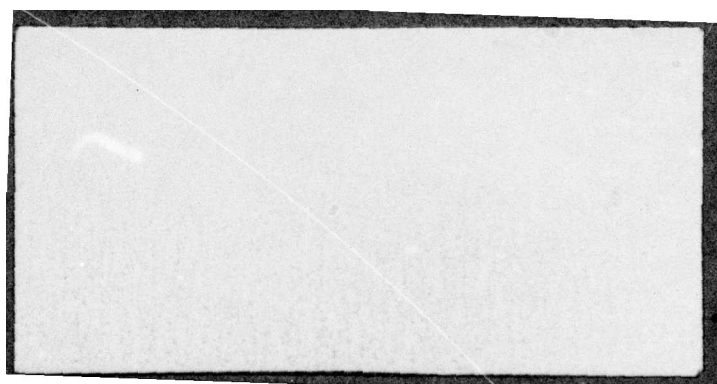
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EVALUATION OF AND RECOMMENDED
CHANGE TO THE RELIABILITY
IMPROVEMENT WARRANTY
(RIW) GUIDELINES.

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Mark C. Jacobson Captain, USAF
Reagan L. Skaggs Captain, USAF

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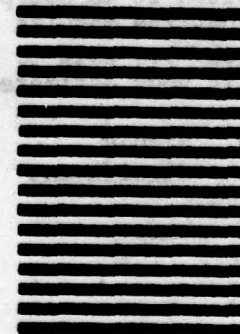
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The reliability improvement warranty is a relatively new acquisition technique in government contracting. To encourage effective use of the technique, HQ USAF Directorate of Procurement Policy (IGP) published the pamphlet entitled Interim Guidelines Reliability Improvement Warranty (RIW) in July, 1974. This pamphlet provided guidance in the areas of application criteria, funding, provisions, determination of cost effectiveness, and general implementation and administrative information. Since the guidelines had not been revised since publication, the researchers' objectives were to determine if the guidelines were adequate and to obtain recommendations for improving those guidelines, if necessary. To meet those objectives, 24 individuals knowledgeable in the area of RIW were interviewed. Their perceptions were gathered through ten scaled response questions that addressed main areas within the guidelines. The distribution of responses were tested via the Kolmogorov-Smirnov two sample test to determine the adequacy of the area. Interviewees also recommended changes to correct perceived problem areas via open ended response questions. The researchers concluded the guidelines were inadequate in a number of areas, e.g., evaluation of candidates, example clauses, administrative concerns and cost-benefit analysis among others. Suggestions for increased detail, more examples, deeper rationale and organization into a regulation were made.

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**EVALUATION OF AND RECOMMENDED CHANGE
TO THE RELIABILITY IMPROVEMENT
WARRANTY (RIW) GUIDELINES**

A Thesis

**Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology**

Air University

**In Partial Fulfillment of the Requirements for the
Degree of Master of Science in Logistics Management**

By

**Mark C. Jacobson, BS
Captain, USAF**

**Reagan L. Skaggs, BS
Captain, USAF**

September 1979

**Approved for public release;
distribution unlimited**

This thesis, written by

Captain Mark C. Jacobson

and

Captain Reagan L. Skaggs

has been accepted by the undersigned on behalf of the faculty of the
School of Systems and Logistics in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN LOGISTICS MANAGEMENT
(CONTRACTING AND ACQUISITION MANAGEMENT MAJOR)
(Captain Mark C. Jacobson)

MASTER OF SCIENCE IN LOGISTICS MANAGEMENT
(ACQUISITION LOGISTICS MANAGEMENT MAJOR)
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COMMITTEE CHAIRMAN

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CHAPTER I

INTRODUCTION

Overview

The declining defense budget dictates a need to explore ways to cut the ownership costs associated with any weapon system. Ownership costs could be defined as acquisition costs and operating and support (O&S) costs. Recently, increased emphasis has been placed upon reducing the O&S costs of a system in addition to acquisition costs. This is in recognition that O&S costs are the largest portion of total ownership costs. One way of reducing O&S costs is to make the systems more reliable.

The services examined the commercial airlines industry because of the airlines' past ability to consistently acquire more reliable equipment than the services (8:B-2 to B-5). One distinguishing characteristic of their acquisition methodology was the use of warranties. The Navy became the first service to apply the lessons learned from the airlines with a warranty concept that would come to be called the Reliability Improvement Warranty (RIW). RIW is a fixed price commitment that involves contractor repair or replacement of equipment that fails during the period of warranty coverage (4:A-4 and A-5). Apparent success of those early warranty

efforts led to the current trial RIW application program.

Since the RIW was a relatively new contracting technique, it followed that detailed information as well as policy guidance was needed by personnel in the field. This information was disseminated to Air Force personnel in July, 1974, via a pamphlet entitled, Interim Guidelines Reliability Improvement Warranty (RIW), published by the HQ USAF Directorate of Procurement Policy (LGP). These guidelines are still used as an aid in evaluating the potential benefits to be gained from the application of RIW in a contract and as general guidance on constructing a RIW contract. An evaluation of the adequacy of the present Air Force RIW Guidelines is the subject of this research.

Problem Statement

Based upon the increasing popularity of RIW and its potential for misuse, the increasing DOD involvement in international coproduction programs which could involve RIW, and lessons learned from previous RIW applications, there is a need to evaluate the current RIW guidelines and recommend changes thereto.

Background

Weapon system reliability, or the lack thereof, is a problem that persistently plagues managers at all levels, not only in the United States Air Force but across the entire Department of Defense. One

need not reflect very long to recall instances where the lack of reliability in a weapon system affected him personally. Such instances are, at best, inconvenient. Frequently the consequences are much worse in terms of unsuccessful missions, increased maintenance costs, and even lives lost.

What is meant by the term "reliability"? There are any number of definitions, many of which seem to define reliability in terms of itself. One of the better definitions is in Military Standard (MIL-STD) 721B, Definitions of Effectiveness Terms for Reliability, Maintainability, Human Factors, and Safety which defines reliability as " . . . the probability that a system will perform satisfactorily for a given period of time when used under stated conditions [34:7]."

Because of the very visible effect on maintainability and logistics support costs, the tendency, in the Air Force, has been to relate the reliability management task to the logisticians, i.e., to the people who support, rather than buy or fly, systems. Therefore, reliability is most often expressed in terms of mean time between failure (MTBF) or mean time between maintenance action (MTBMA). Logistics reliability requirements are frequently traded off against traditional performance goals (speed, accuracy, altitude, endurance, etc.) when determining the allocation of scarce resources, such as time and money. The overall goal to be sought during these trade-offs is availability. According to General Bryce Poe, AFLC

commander, "Availability is the key [39]" to the success of the Air Force mission. Since reliability is the overwhelmingly important factor in availability, especially as weapon systems age and become more prone to failure, more reliability is urgently needed. General Poe illustrated his thinking with this example. If an engineer says he can design an aircraft to takeoff on a shorter runway, or fly higher or faster than specified, we need to tell him to turn down the wick--give us the "specs" and, make it last longer (39). Therefore, in as much as reliability directly affects availability, it also affects other issues, such as strike force size and total force size. Reliability should be considered as much a "performance" factor as speed or endurance (43:15-16).

Increasing costs. Coupled with the very real need for reliable equipment, the declining defense budget makes it imperative to explore ways to cut the ownership costs associated with any weapon system. The cost of a weapon system is very similar to an iceberg. Research and development as well as procurement costs are the visible portion, but the costs to operate and maintain the system are less visible.

Former AFLC Commander General Rogers commented:

Until recently, government and industrial design engineers were motivated primarily by performance, schedule, and cost considerations during this process. But operating and support outlays have gradually surpassed the historically higher acquisition costs and grown out of proportion to the original costs of some weapon systems [42:47].

Because the cost problem is across the complete life cycle, the entire weapon system life cycle must be addressed in order to solve the cost problem (1:1-36 to 1-37).

There are three acquisition methods currently in use which are intended to deal with the very real weapon system ownership costs. Life cycle costing considers life cycle cost in the various decisions associated with acquiring an item of equipment or a weapon system. Design to cost is a management concept to control acquisition and support costs through quantified cost goals. The third method, reliability improvement warranty (RIW), will be discussed in some depth in the following paragraphs (1:1-38 to 1-43).

Early warranty applications. The success of the commercial air transport industry's procurement process with the warranty has not gone unnoticed by the DOD. This process has proven effective in providing the airlines highly reliable equipment at competitive prices. In comparing Air Force and commercial airline instrument landing systems, believed to be comparable in performance, operational characteristics, and age, the commercial systems were acquired for approximately half the price of the Air Force systems, but the MTBF of the commercial systems was roughly two to four times that of the Air Force systems. One of the predominant features of the airline procurement environment is the extensive use of warranty (1:8-25 to

8-28).

In 1972, delivery was completed on 126 additional A24G-27 gyros for the F/FB-111 aircraft. These gyros were procured through competition and the contract included a long-term warranty provision calling for 3,000 hours or five years of use. The acquisition cost of these 126 gyros was 37% lower than the gyros initially bought and the MTBF was 35% longer by mid-1974 (1:9-7 to 9-8).

To prove that their hydraulic pump had inherent design features which would result in higher efficiencies and longer life than any competitor's pump, Abex Corporation very aggressively pursued any procurement methodology during the late 1960s which utilized high reliability and/or lower life cycle cost as criteria for award. Thus the Abex model AP27V-5-02 pump was installed on the Navy's F-14A fighter as contractor furnished equipment. By mid-1975 the mean time between return of these pumps had increased to more than 800 operating hours which exceeded the specified end point of 750 operating hours per return (1:9-9 to 9-10).

Reliability Improvement Warranty

Out of this backdrop of warranty application the Reliability Improvement Warranty concept was developed.

A Reliability Improvement Warranty is defined as a provision in either a fixed price acquisition, or fixed price equipment overhaul contract in which:

- (a) the contractor is provided with a monetary incentive,

throughout the period of the warranty, to improve the production design and engineering of the equipment so as to enhance the field/operational reliability and maintainability of the system/equipment; and

(b) the contractor agrees that during a specified or measured period of use, he will repair or replace (within a specified turn-around time) all equipment that fails (subject to specified exclusions if applicable) [4:A-4 and A-5].

It should be noted that the reliability improvement warranty is not simply a maintenance contract. The contractor is not required to perform routine preventive maintenance, cleaning, etc. Additionally, the RIW does not cover items such as filters and light bulbs that are expected to need replacement in normal operation (4:A-1 to A-2).

The objective of RIW is

. . . to motivate and provide an incentive to contractors to design and produce equipment which will have a low failure rate as well as low repair costs, after failure due to field/operational use. Furthermore this technique attempts . . . to provide an incentive for contractors to improve the reliability of their equipment and to reduce repair costs during the period of warranty coverage in order to maximize their profits [4:A-1].

Incentives. The idea of incentives as it relates to RIW was pointed out very vividly in an ARINC Research Corporation report.

The incentive power of RIW can best be examined by comparing the normal procurement with a warranty procurement. In a normal procurement a contractor may realize his maximum profit delivering the lowest reliability that will be accepted by the customer. Not only does he reduce his manufacturing and quality-control cost, but he enhances his opportunity for sale of spare units, service contracts, and replacement parts to provide necessary operational support. . . . Under RIW, the contractor takes on an obligation for maintenance support for a specified period on a fixed-price basis; thus his profitability is tied to field reliability. Ideally, then, he will be motivated

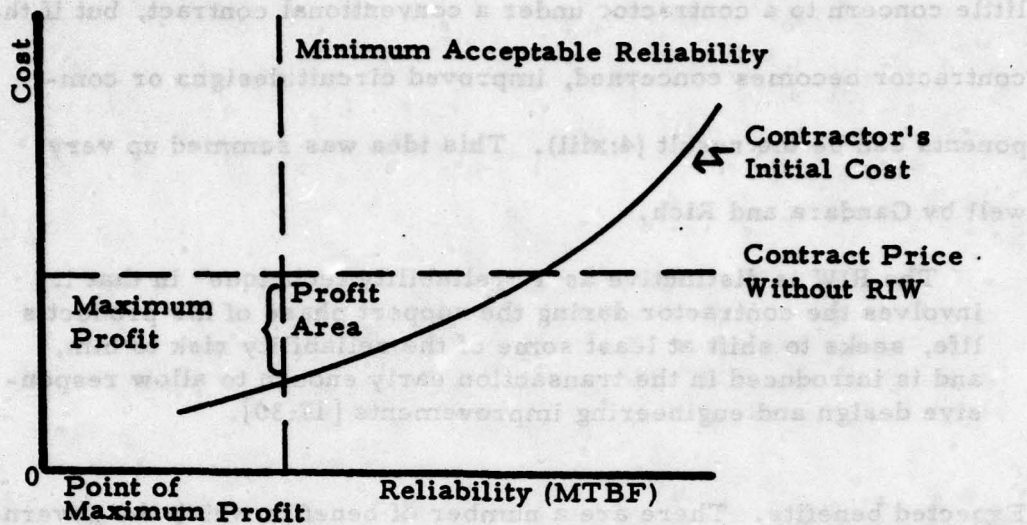
to increase reliability to reduce his costs [6:2-2].

Refer to Figures 1 and 2 for a graphical presentation of these concepts.

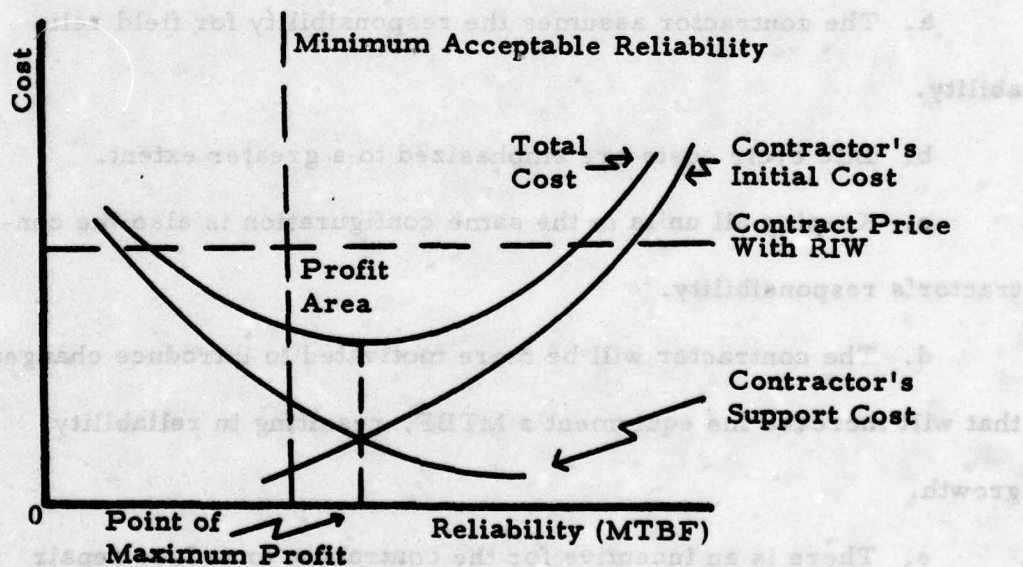
The firm fixed price contract, generally established by competitive bidding, provides this incentive. Competition can, therefore, be considered one of the keys to the application of the RIW contracting technique (29). In one sense, a contractor is in competition with the Air Force's maintenance complex, because RIW will not be utilized unless there is an expected cost/benefit advantage to doing so.

The reliability improvement warranty is frequently used in conjunction with a mean time between failure guarantee which requires the contractor to institute corrective action and to provide consignment spares in the event the guaranteed level is not met. A reliability improvement warranty contract is designed to motivate the contractor to improve MTBF through his maintenance support commitment. The MTBF guarantee is an even stronger incentive because of the contractor's obligation to provide spares to relieve pipeline shortages (6:vii).

Carrying the idea of contractor incentive a little further, there is reason to believe that the contractor's active involvement in the operational phase of a system's life cycle will have the added benefit of improving equipment's resistance to system induced failures, such as voltage fluctuations. Realistically speaking, such failures are of



EFFECT OF RELIABILITY ON INITIAL COST (26:Fig. 1)
Figure 1



EFFECT OF RELIABILITY ON INITIAL AND SUPPORT COSTS
(26:Fig. 2)

Figure 2

little concern to a contractor under a conventional contract, but if the contractor becomes concerned, improved circuit designs or components can be the result (4:xiii). This idea was summed up very well by Gandara and Rich.

The RIW is distinctive as a "reliability technique" in that it involves the contractor during the support phase of his product's life, seeks to shift at least some of the reliability risk to him, and is introduced in the transaction early enough to allow responsive design and engineering improvements [17:30].

Expected benefits. There are a number of benefits which the government is expected to receive through the RIW contracting procedure (4:A-16 and A-17):

- a. The contractor assumes the responsibility for field reliability.
- b. Life cycle costs are emphasized to a greater extent.
- c. Keeping all units in the same configuration is also the contractor's responsibility.
- d. The contractor will be more motivated to introduce changes that will increase the equipment's MTBF, resulting in reliability growth.
- e. There is an incentive for the contractor to reduce repair costs; such reductions will increase his profit or minimize his loss.
- f. Initial support investment required by the Government will be minimal.

g. The requirement for skilled military maintenance and support manpower may be reduced through RIW usage.

Another source pointed out an additional benefit to the customer (Government). The using organization will be better able to budget future operating costs, because any required maintenance is performed by the contractor as part of the fixed price contract (25:55).

It would certainly be unreasonable to think contractors would enter into any arrangement that would only benefit the Government.

Expected benefits to contractors include:

- a. When the MTBF is improved above the pricing base, there is an increased profit potential.
- b. There is multi-year guaranteed business.
- c. Becoming more familiar with the operational and maintainability characteristics of his equipment should help the contractor in obtaining follow-on contracts (4:A-17). The fact that all failed units are returned to the factory for maintenance allows feedback to occur much more rapidly than otherwise possible. Engineers can learn of design or component weaknesses quicker and can take corrective action (25:55).

Risk shifting. Risk shifting was introduced earlier and is an idea that should be discussed in more detail. The idea that contractors are being asked to assume totally the risks associated with system

field problems has caused some misgivings. It must be understood that the Government is paying a fixed price for a RIW that is expected to cover all maintenance costs. Any risk on the contractor's part results from the actual cost exceeding the warranty price. Therefore, he is able to reduce his risk to a point of his choosing, considering the competitive pressure of the procurement and the Government's willingness to take the warranty option. In the same manner, the Government risks paying too much, if the system performs better than expected (6:xiv).

Negative aspects. A number of the positive aspects of the RIW have been pointed out, but there are also certain potential disadvantages (6:3-2):

a. The potential for legal disputes is high. Therefore, close coordination between the user, logistic, and legal activities is required until experience is gained in RIW contracting techniques.

b. System acquisition costs may be increased as the result of the contractor's expending additional effort to achieve good initial reliability, and spares cost may be increased as a result of sparing at the line replaceable unit level rather than at the module level.

c. An increase in the number of military maintenance technicians is sure to be required, when the transition to organic maintenance occurs. Thus, one of the expected benefits quickly becomes

a problem in reobtaining the skilled people.

d. The ability to respond quickly in emergency situations may be impaired, thus new or modified procedures must be developed to support the RIW concept without adversely affecting the logistic management function.

RIW Guidelines

The Assistant Secretary of Defense (Installations and Logistics) directed, in August, 1973, trial use of warranties by the services ". . . in the acquisition and initial operational support of a number of Electronic Subsystems [5:1]." Responding to the DOD directive, the HQ USAF Directorate of Procurement Policy (LGP) published a pamphlet entitled Interim Guidelines Reliability Improvement Warranty (RIW) in July, 1974 (51). This pamphlet is referenced in both the AFLC and AFSC supplements to the Defense Acquisition Regulation, paragraph 1-324.50, as a guide to be used in the application of RIW (50). It provides guidance in the areas of application criteria, funding, essential contract clause elements, and determination of cost effectiveness (51:ii). Henceforth, this pamphlet will be referred to as the Air Force RIW guidelines.

The Air Force RIW guidelines are intended to aid in determining whether economic and reliability benefits can be achieved through the use of the RIW. A summary of the contents of the guidelines is

contained in Table 1. The following paragraphs discuss some of the more important aspects of the guidelines.

Generally speaking, guidelines are not inflexible, and this is the case with the Air Force guidelines. There are, for example, fourteen application criteria in these guidelines. Two of the criteria are "The equipment has a potential for both reliability growth and reduction in repair costs" and "There is a reasonable degree of assurance there will be a high utilization of the equipment [51:10, 11]." The flexibility of the Air Force RIW guidelines is illustrated by the following extract (51:11).

It is noted that the equipment need not meet all the criteria shown above in order to apply an RIW. Rather, at this point in time, we should pick logical candidates meeting several or many of the criteria so that further assessment can be made of the value of this technique.

Policy guidance contained in the Air Force RIW guidelines has clarified at least one source of difficulty in applying the RIW contracting technique. For example, funding the RIW raises the question of who pays for the warranty. The guidance is that "RIWs shall be funded from the same appropriation as the acquisition or overhaul warranted [51:14]."

In August, 1974, the DOD validated the concepts contained in the Air Force RIW guidelines by issuing an abbreviated set of guidelines (4) that closely paralleled the Air Force RIW guidelines. The differences involved minor structural changes and the omission of

Introduction

Scope

Definition

Potential Benefits from Use of RIWs

Benefits to Government

Benefits to Contractor

Guidelines for Application

RIW Application Criteria

**Determination of Cost Effectiveness of Use
of a RIW**

Funding Guidance

Funding of RIWs

Requirements and Restrictions

Essential Elements in RIW Clause

Statement of Contractor Warranty

Contractor Obligations

Government Obligations

Miscellaneous

Data Requirements

Evaluation Criteria

RIW Evaluation Approach

Factors in Evaluating RIW Results

RIW Administration

Conclusion

Appendix

Examples of RIW Data Reports and Clauses

CONTENTS OF THE RIW GUIDELINES (51)

Table 1

several appendices involving RIW clause examples and RIW data report examples.

Evolution of the RIW guidelines. Both the DOD and the Air Force RIW guidelines evolved from past experiences and from managerial attempts to obtain more reliable equipment and to hold costs down. Rising operating and maintenance costs clearly underscored the need for innovation in contracting and acquisition techniques in the DOD. Generally, efforts to induce contractors to design reliability and low-cost support features were not successful. Such attempts included (1) combining target MTBF in performance specifications with unit production cost goals and (2) soliciting life-cycle cost (LCC) estimates from competing contractors for incorporation into the source selection decision process (17:5).

Commercial airline acquisition methodology. Avionics equipment form, fit, and function interchangeability profiles had been developed since the mid 1930s for use by the airlines industry as part of the commercial airlines acquisition methodology (CAAM). A predominant feature of CAAM was the use of warranty clauses in acquisition contracts (19:2-1 thru 2-34). The profiles and contracting techniques of CAAM were the forerunners of the DOD and Air Force RIW guidelines. A detailed study of CAAM conducted by ARINC Corporation resulted in formal construction of a list of CAAM guidelines that

closely resembled the present RIW guidelines, and in fact, formed their basis.

Failure Free Warranty. The Navy's 1967 contract for the repair of gyroscope platforms was the first DOD application of a reliability warranty. At that time the concept was called Failure Free Warranty (FFW) (46:12 and 12A). Three aspects of the FFW differed greatly from past contracting experiences: (1) all field failures were covered under warranty for an extended time period, (2) risk was shifted so that the contractor shared any reward (expanded profit) or penalty (fixed price) with the government and (3) reliability was measured in field operation after hardware acceptance (28:26-30). The term Reliability Improvement Warranty eventually came to be preferred over the term Failure Free Warranty because of the implication that there would be no failures during the warranty period, or that the warranty would be free. The lessons learned during the administration of this and other early applications further contributed to the evolving guidelines (45:13).

Justification for Research

The purpose of the research is to determine the adequacy of the Air Force RIW guidelines and to suggest improvements, if necessary. The research is based upon the fact that the RIW is a trial concept that is evolving within a changing acquisition environment.

Keeping in step with change is difficult--the preface of the DOD RIW guidelines implies the need for research as a means to improvement, as this portion taken from the preface indicates:

To realize the maximum potential from the use of RIWs, it is important not only to identify the good results but also to identify the problem areas so that the latter can be factored in and corrected in the Guidelines [4:2].

A phase of this factoring process was accomplished one year after publication in response to critical comments from the Council of Defense and Space Industry Associations. Industry comments indicated a perception that the RIW concept placed undue risk upon the contractors due to the schedule, and development constraints.

In April, 1976, Headquarters USAF levied extensive review requirements upon RIW use. The requirement for the reviews was reiterated in an AFALD Headquarters policy letter in February, 1978, with these additional comments:

Perhaps when more experience with RIWs has been gained, we can suggest a reduction in emphasis on the joint reviews. Experience indicates that better control and integration of RIW provisions is a valid need at this time [44:2].

The difficulties of control and integration of RIW provisions were restated in a March, 1978, ASD Headquarters policy letter. "Several recent instances indicate that some of our procurement personnel are not aware of the procedures governing selection, preparation, review and approval of RIW provisions [41:1]."

Also, in a recent interview with AFALD personnel, it was

learned that RIW users saw the effect of RIW as being substantially different from what was presented in the guidelines. RIW was thought to be more strongly related to production quality than to reliability improvement during the warranty period (16).

Finally, application of RIW to systems involved in international coproduction is not addressed in the guidelines. There are potential problems in this area with increased complexity of contract terms, longer lead times, and political implications (13).

Research Objectives

1. To determine if the Air Force RIW guidelines are adequate.
2. To obtain recommendations for improving those guidelines, if necessary.

Research Questions

1. Do the Air Force personnel involved in the contracting process perceive the Air Force RIW guidelines as adequate?
2. What changes should be made to the Air Force RIW guidelines?

CHAPTER II

RESEARCH METHOD

Overview

Chapter I provided a general background and justification for research on the subject of the RIW guidelines. The research objectives were to determine if the RIW guidelines are adequate and to improve the guidelines, if necessary. The research questions indicated the method of achieving the objectives was to collect the perceptions of Air Force personnel, having RIW relevant experience, concerning the adequacy of the guidelines. Suggestions on changes that should be made to the guidelines to achieve adequacy were obtained from those same personnel.

Chapter II specifies the variables that were considered in the study. This includes operational definitions of the variables and a breakdown of the specific attributes of the variables. Also there is a discussion of the instrument construction and validation process-- in short, how validity and reliability were obtained both in the instrument, and in its application. Then a discussion of the data collection plan describes the population, sample, sampling plan, and how the data was gathered under the attributes of adequacy. This will be followed by the Data Analysis Plan which (a) explains how the

collected data was treated to bring it to a quantifiable measure, (b) establishes the criteria, hypothesis tests, and significance levels that were used to test each attribute of adequacy to determine if the criteria were met and if the test was significant. Finally the assumptions necessary in the employment of the research method and the limitations of the findings derived from the research are listed.

Variable Selection and Specification

This study deals with the "perceptions" of Air Force personnel concerning the adequacy of the RIW guidelines. An interview research approach, in which new data (respondent perceptions) were created and analyzed, was determined to be appropriate. This section of the research method chapter explains the selection and specification of the variables and the construction and validation of the interview guide that was used to gather the research data.

The research questions specify what is to be measured, i.e., the adequacy of the RIW guidelines and possible changes to improve them. Therefore, the two variables in the study are adequacy and need for change. These variables are the mechanisms of measurement by which the research questions are answered. Specification of the variables is aided through operational definitions. An operational definition is based on observable, measurable characteristics that are associated with what is being defined. A unique definition is

desirable. That is, the more exclusively associated the observable criteria and the defined quantity, the more useful is that operational definition (49:57-65).

As a first step in operationalizing adequacy, a dictionary definition is, "equal to or sufficient for some (specific) requirement [52:31]." Further, selected attributes of adequacy amplify this definition; two attributes identified are: complete and helpful. Given these attributes the following operational definition is provided for adequate:

1. Complete. The guidelines are complete, if the user does not have to refer to other sources to determine the issues to be considered.
2. Helpful. The guidelines are helpful, if use of the guidelines aid the users in arriving at decisions concerning RIW issues.

Need for change can be operationally defined through its close connection to adequacy. Simply stated, the guidelines need to be changed, if the guidelines are determined to be inadequate in either of the aforementioned attributes.

Instrument Construction and Validation

An important factor in instrument construction is validity. There are two main types of validity--internal and external. Internal validity is the ability to measure accurately what is supposed to be

measured. On the other hand, external validity is the amount of confidence that can be placed in generalizations from the research conclusions. External validity is dealt with in the discussion of the data collection plan. It is important to note that satisfactory external validity is impossible without satisfactory internal validity (14:120). An important part of internal validity is instrument question construction.

Emory (14:229) summarizes four important areas in developing questions for a survey instrument. These areas are (1) question content, (2) question wording, (3) question response form, and (4) question sequence.

Each of these areas is important in developing effective questions. For the first area, question content, the main concerns were, can and will the interviewees respond meaningfully. This necessitates questions that are of proper scope, and appropriate to the study effort and the subject area. The guide was developed with a specific population in mind, i.e., those who have RIW relevant experience and who would not have to rely on second hand perceptions from others. By specifying the population in this way all respondents should be able to provide meaningful information. The questions were centered around current issues in the RIW area that would be familiar to those who have worked with RIW. The questions were designed to be specific enough to avoid ambiguity. Additionally, the interview

technique permits clarification where necessary. Finally, the subject area is not of a sensitive nature, and willingness to participate freely is expected.

Under question wording, each question was designed to be as clear as possible, i.e., stated in terms of a shared vocabulary and without biased or unnecessarily restrictive wording. Difficulties in this area were reduced by a review of the interview guide by selected persons who were knowledgeable in the field but not part of the population.

An oral interview question format was chosen for the study. This format was selected, because it allowed greater depth of response and presented the best opportunities for response-keyed questions. The oral interview allowed recording of spontaneous elaborations and provided for more complete answers. Also, since people find it easier, in general, to talk than to write, the oral interview was expected to generate more information.

In addition to the above reasons for selecting an interview format, another important reason was practicality. As Emory notes, "The scientific requirements of a project call for the measurement process to be reliable and valid, while the operational requirements call for it to be practical [14:126]." The main aspects of practicality that resulted in the format chosen were economy and convenience. This format seemed to offer the best blend of validity and practicality

in collecting the required data.

The questions asked during the interview required two different response modes. A portion of the questions on the interview guide elicited scaled response, while another section contained open ended type questions. Both sections were used in determining guideline adequacy. The combination of open ended and scaled questions provided a good combination of response modes in which the tendency toward biasing with a scaled response (e.g., the tendency to rate on the middle of the scale) could be moderated by the open ended response in which a fuller response was possible. Also, the open ended questions were intended to elicit responses that suggested areas of needed change within the two attributes of adequacy, that were not structured into questions, or were not considered. Additionally, the responses to open ended questions provided some ideas for the changes that should be made to remedy deficiencies that were brought up during the interview.

Attention was given to question sequence mainly in that the classification questions were placed at the end of the interview guide, in order to avoid any reactions of defensiveness that may occur in response to questions that may be viewed as private or embarrassing. Because the guide was designed to be brief, relatively little attention was placed on sequence within the sections, especially since the questions were of about equal difficulty and covered only one area each.

The attention given to these areas of question construction form a limited basis for instrument validity. This base was strengthened through a review of the interview guide by knowledgeable AFIT faculty and selected base personnel. This was a limited review to uncover ambiguities, or areas of uncertainty. An independent review was selected because of the small number of people who were available to form the sample. It was anticipated that incorporating the independent group's reactions to the form, content and usefulness of the guide to obtain the desired information provided an adequate amount of validity for the purposes of this study.

Reliability, i.e., consistency, is a necessary part of validity and was considered in the instrument design through the development of the interview guide questions. The reliability attained was gained in part through definition of adequacy in terms of its attributes which were, in turn, operationally defined before being included in the interview guide. Use of these multiple indicators should result in improved reliability, in that, if adequacy is indicated throughout, it will have been viewed in two different ways. Finally, the instrument was administered uniformly by both researchers. The first few interviews were conducted by both researchers to establish a common understanding on the details of how the interview was to be conducted. Since no problems surfaced during this mini pilot study, these interviews were included as part of the sample.

Prior to beginning the interview the purpose and method of the interview was reviewed with the interviewee, and a relaxed, non-threatening atmosphere was encouraged. Also, bearing in mind the potential biasing effect of the interviewer questions and responses, the structure of the previously validated interview guide was followed as much as possible without dampening respondent enthusiasm.

Data Collection Plan

The universe for this research was all DOD personnel involved in the acquisition process who are experienced in the use of the RIW contracting strategy. Within this universe was the smaller population of Air Force RIW knowledgeable personnel that was sampled. The population was those who have worked with the RIW guidelines at some time, either selecting candidates/developing clauses, or, those personnel involved in the current RIW review and administration process. This is not to say that personnel must have used RIW to be considered in this study. However, unless they have at least considered using the RIW technique in a contract, they were not included in the population.

The sample was a convenience--judgemental sample that was based upon two sources. The first source was a semi-annual RIW report (from 1977 to date) prepared at both AFSC and AFLC at the

headquarters level. In this report all RIW applications currently under contract, and all contemplated RIW applications are listed and a contact point is provided for each item. The second source of sample candidates was personnel involved in the RIW review and administration process. Part of this selection was based upon office position, e.g., AFSC and AFLC both have RIW monitors, and AFLC has personnel designated directly with RIW analysis. Selection was also based upon knowledge and experience within these areas. Finding RIW knowledgeable personnel was a difficult task and was based mainly upon the indications gained during many personal interviews conducted during the initial stages of research. Because of the relatively small number of people available, an attempt was made to interview as many people as could be identified who met the established criteria.

The fairly recent time frame was selected because the study deals with "perceptions," and current perceptions were judged to be easier to obtain and more valid. The assumption was that sampled personnel provided their honest perceptions of the adequacy of the guidelines and some explanation for their opinions.

While this may be considered a restricted sample, it is felt that it is generalizeable to future AF programs that use the RIW process, because it is representative of the mix of people who will be working the programs in the future. The individuals interviewed

were from different levels of responsibility, civilian and military personnel, with varying degrees of experience.

The collected data was tested by individual question. However, the questions were grouped under one of the attributes of adequacy previously defined. Classification questions at the end of the interview guide allowed sample stratification for clarification of the results.

Data Analysis Plan

The analysis plan has two major divisions that relate directly to the research questions, which deal with guideline adequacy and need for change. The first division/question is concerned with guideline adequacy. In order to answer the questions of this division, adequacy was described via two attributes or characteristics. The interview questions were related to these attributes. The questions were designed to measure the perceived adequacy of the guidelines as regards specific issues in the RIW area. The interview questions can be grouped under one of the two attributes of adequacy so as to allow analysis in terms of the more specific attribute rather than the broader, overall term adequate. For example, one attribute of adequate is completeness. An interview question that would map into this attribute would be, "Are the guidelines sufficiently detailed regarding the types of funds to be used for contracts incorporating

RIW? " If analysis of this question indicates the guidelines are perceived as not sufficiently detailed then the guidelines are not adequate, and more specifically they are not adequate because they are not complete. The relationship of interview questions to attributes to the research question presents a logical and interpretable analysis flow, that should make the analysis clearer and provide adequate support for the conclusions.

Each interview question was analyzed separately to determine adequacy (via the attribute selected). The Kolmogorov-Smirnov one-sample test, a goodness of fit test, was projected to be used to test the distribution of scaled responses for the question, against a criterion distribution which was a theoretical estimation of how the scores should have been distributed based upon the judgement of the researchers. The sample distribution was tested against the criterion distribution at the 90% confidence level. The test was structured as follows:

H_0 : sample distribution = criterion distribution (adequate)

H_1 : sample distribution \neq criterion distribution (inadequate)

If the null hypothesis could be rejected with 90% confidence, (i.e., 90 out of 100 times the difference between the distributions was an actual difference, rather than a difference due to random fluctuation) then the difference was accepted as statistically discernable and the

conclusion of inadequacy was drawn through default (47:47-52).

This exercise was repeated for each scaled response question. For each question in which the null hypothesis was rejected a conclusion of inadequacy was drawn.

The test described above was performed by computer using the Statistical Package for the Social Sciences (SPSS), Version 7 (36; 37). In the SPSS package used to perform the Kolmogorov-Smirnov one-sample test, only three theoretical distributions (uniform, normal, or poisson) were available for use as the criterion distribution. However, neither of these distributions were appropriate for this test. Therefore, the one sample test could not be performed unless it was done by hand. In order to use the computer to perform the tests, an adjustment was made. The difficulty was overcome by performing the Kolmogorov-Smirnov two-sample test in which the criterion distribution developed by the researchers was used as one of the sample distributions (47:127-136).

The second division of the plan was tied mainly to the responses received in the first section. The second section dealt with changes that were required in the guidelines. If the first section indicated inadequacy in terms of either of the attributes of adequacy, the second section provided direction on the changes that needed to be made to correct inadequacy. This section tied together the results of the scaled responses, hypothesis tests and the open ended

responses in order to develop recommended changes. These concepts can be graphically portrayed as indicated in Figure 3.

Interpretation of experimental results required more detailed analysis of the data collected. This was because the results tended to deviate from those hypothesized by the researchers. The classification data collected was used to stratify the sample and test for significant differences between subgroups.

Assumptions

1. The results of the survey of the current RIW knowledgeable individuals can be generalized to future populations because personnel policies and practices will remain the same.
2. The interviewees provided their honest perceptions of the adequacy of the guidelines and changes for improvement.
3. The five point scale used on the interview guide provided enough categories of choice so as not to mask differences in perceptions, and to make comparison meaningless.

Limitations

The hypothesis test involved the establishment of a theoretical distribution that reflected adequacy and was based on the judgement of the researchers. If this distribution was changed the test results could be different, with correspondingly different results.

Attributes of Adequacy	Interview Questions	SECTION 1			SECTION 2
		Hypothesis Test $\alpha = .10$ Kolmogorov-Smirnov Two Sample Test		H_0 Rejected	
		Sample Distribution	Criterion Distribution		
Complete					
Helpful					

ANALYSIS METHODOLOGY

Figure 3

CHAPTER III

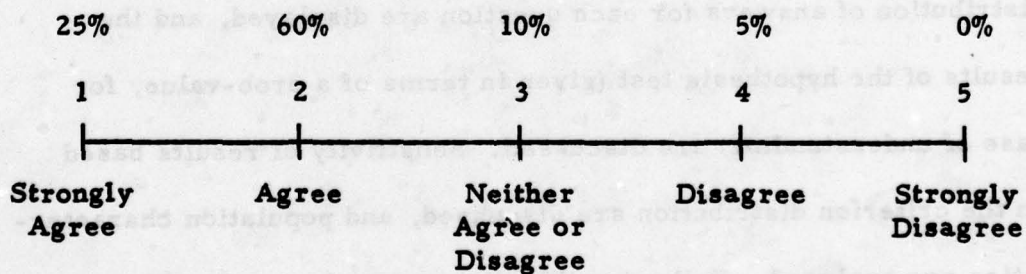
ANALYSIS OF RESULTS

Overview

This chapter presents the findings that resulted from the analysis of data collected via interview. The framework for analysis was presented in the previous chapter and was structured around a question-by-question test of adequacy through scaled response questions. Other, open ended, questions provided suggestions for improvement to the guidelines and were a necessary elaboration of comments received through the more structured scaled response questions. Therefore, in this chapter, the analysis results are presented on a question-by-question basis for the ten scaled response questions. The actual distribution of answers, and the criterion distribution of answers for each question are displayed, and the results of the hypothesis test (given in terms of a prob-value, for ease of understanding) are discussed. Sensitivity of results based on the criterion distribution are discussed, and population characteristics are analyzed. Following this discussion the results of the open ended questions are presented on a similar question-by-question basis.

Scaled Response Question Results

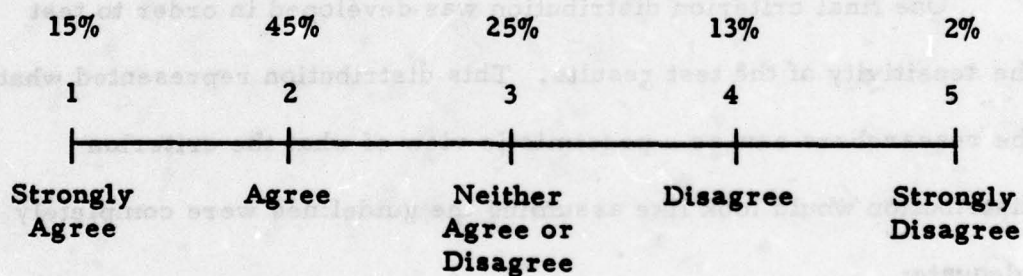
Criterion distribution. The criterion distribution was developed based upon a review of current literature dealing with the actual and potential problems and benefits of using the trial concept of RIW. RIW guidelines can be a means toward avoiding problems with the RIW technique, and a means of encouraging its effective and efficient use. If inadequate, the guidelines could be a hindrance, contributing to misapplication of the technique. Such an occurrence could easily invalidate what may be a valid RIW application. Therefore, the distribution was designed to be a standard not only for the guidance that is currently needed, but also for what is needed to provide the most complete and helpful guidance available. With this in mind the following distribution (illustrated in terms of the scale used on the interview guide) was developed:



The conceptual foundation underlying this distribution was discussed with experts in the area of RIW throughout the research and specifically during the early stages of data collection (7; 31; 48). In the

opinion of the researchers this distribution represents an optimistic but certainly not unrealistic estimate of how a knowledgeable population would rate an adequate document (it is important to stress that this distribution was built around the assumption of a completely adequate document).

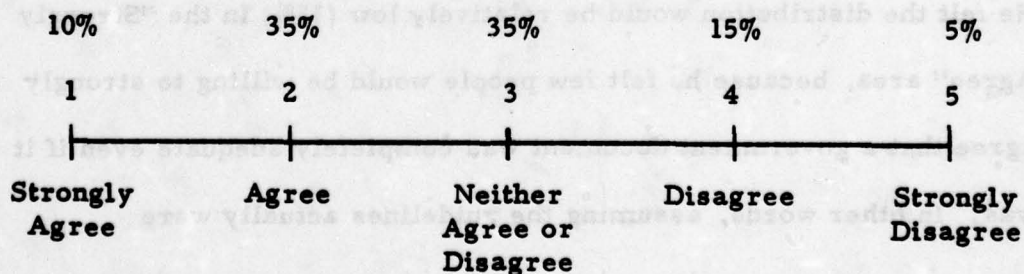
The criterion distribution was also discussed with Lt. Col. Goldstein, HQ USAF/RDCS, OPR for the guidelines (18). He prefaced his comments by stating any distribution he would estimate could only be based on his personal intuitive feel for the area. He felt his comments would be as much a guess as anything else, but doubted that anyone could supply a distribution that could be accepted as authoritative. He described the following as his estimate of the criterion distribution.



He felt the distribution would be relatively low (15%) in the "Strongly Agree" area, because he felt few people would be willing to strongly agree that a government document was completely adequate even if it was. In other words, assuming the guidelines actually were

completely adequate and a population of RIW knowledgeable people were asked to rate the guideline's adequacy, only 15% would commit themselves to a rating of "Strongly Agree." He felt 70% of the population would rate within the "Agree," or "Neither Agree or Disagree" categories with a split out of about 45% and 25%, respectively, for a really well written, adequate document. The remaining 15% would rate (breakout not expressed) within the "Disagree" or "Strongly Disagree" categories because of disagreement with the policies expressed in the document (ignoring adequacy), or because of other outlier characteristics. In the opinion of the researchers this distribution represented another realistic, but certainly less optimistic, view of what the criterion distribution might look like for adequate RIW guidelines.

One final criterion distribution was developed in order to test the sensitivity of the test results. This distribution represented what the researchers saw as a pessimistic view of what the criterion distribution would look like assuming the guidelines were completely adequate:



In research of this type it could be argued that if any improvement could be made to existing guidelines, some forum should be available to present these ideas. To require a firm judgement of "inadequate" towards a document before attempting to improve that document would not seem to be a wise position. By accepting a more optimistic criterion distribution any potential problem areas should be identified earlier, and allow earlier correction. Going one step farther, the crucial issue is not the labeling of an area adequate, marginally adequate, decreasing in adequacy or even inadequate. The issue is finding ways of improving what is currently in use. Selection of an optimistic criterion distribution would seem to have some advantages. However, selection of an unrealistically optimistic criterion distribution would only distort the real situation. To prevent researcher bias, the results, based on three separate tests, each using a different criterion distribution, are presented.

Actual distribution test results. The results of the scaled response portion of the interviews are presented in a uniform tabular format. First, the criterion distributions are shown, followed by the actual distributions, then the prob-values and finally the results of the tests. The two distributions, actual and criterion, were tested via the Kolmogorov-Smirnov two-sample test to determine if the distributions were significantly different. The computed prob-value indicates the

likelihood of these two distributions being different due to random fluctuation. Therefore, a very low prob-value indicates that the difference between the two distributions that could be attributed to random fluctuation is so unlikely that the difference can be accepted as an actual difference. Because the probability is so low the null hypothesis (which is the assumption that the distributions are the same or, in other words, that the guidelines are adequate) can be rejected. At this point, the alternate hypothesis (that the distributions are not the same, indicating guideline inadequacy) is accepted by default. A tabular format was selected, because it allowed presentation of detail without sacrificing a "big picture" view of the main aspects of guideline adequacy under review. The results are presented beginning with the test using the most optimistic criterion distribution (called criterion 1), then the less optimistic criterion distribution (called criterion 2), and finally the pessimistic criterion distribution (called criterion 3). Refer to Table 2 for a summary of the results.

Comments on test results based on different criterion distributions.

Based upon the first criterion distribution, test results indicated rejection of the null hypothesis, which assumes adequacy, for all questions except questions six and eight (guideline organization and guideline readability/understandability). By dropping to the second

EXPECTED DISTRIBUTION OF RESULTS								
SCALED RESPONSE CRITERION	1	2	3	4	5			
1	6	14.4	2.4	1.2	0			
2	3.6	10.8	6	3.1	.5			
3	2.4	8.4	8.4	3.6	1.2			
ACTUAL DISTRIBUTION OF RESULTS						PROB-VALUE/TEST RESULT BASED ON CRITERION		
SCALED RESPONSE QUESTION	1	2	3	4	5	1	2	3
1	0	11	1	11	1	.013*	.096*	.196
2	0	7	3	9	5	.002*	.020*	.049*
3	0	11	2	8	3	.031*	.185	.344
4	0	8	7	6	3	.005*	.432	.785
5	0	2	2	11	9	.000*	.000*	.000*
6	2	11	5	6	0	.259	.998	1.00
7	1	6	7	10	0	.002*	.255	.551
8	3	16	2	2	1	.992	.744	.147
9	0	6	5	9	4	.001*	.046*	.102
10	1	7	6	6	4	.005*	.328	.551
* Reject H_0 $n = 24$ $\alpha = .10$ Confidence Level = 90%								

SUMMARY OF TEST RESULTS
Table 2

criterion distribution, the null hypotheses for four additional questions could not be rejected (question three--funding, question four--costs and benefits, question seven--logical flow of guidelines and question ten--framework for cost-benefit analysis). Under the third criterion distribution, the null hypotheses for two more questions could not be rejected (question one--evaluation of candidates and question nine--examples in the guidelines). Alternately stated, tests with criterion one indicated eight areas of inadequacy, criterion two indicated four areas of inadequacy, and criterion three indicated two areas of inadequacy. This type of analysis has shown the sensitivity of the results based upon the different standards of comparison (the criterion distributions). In any case, it also allows one to assess the predominant problem areas in the guidelines. As shown in Table 3, the areas of Provisions and Administration were found inadequate under all three criterion distributions. Evaluation of Candidates and Examples were found inadequate under criterions 1 and 2, while four other areas, Funding, Identification of Costs and Benefits, Logical Flow of Information, and Framework for Cost-Benefit Analysis were found inadequate only under the most optimistic criterion distribution (1).

Population segmentation. The question always arises in research of this type whether the results vary depending upon the characteristics

Question	Inadequate	under	Criterion:
# Area	1	2	3
2. Provisions	X	X	X
5. Administration	X	X	X
1. Evaluation of Candidates	X	X	
9. Examples	X	X	
3. Funding	X		
4. Identification of Costs and Benefits	X		
7. Logical Flow of Information	X		
10. Framework for Cost-Benefit Analysis	X		
6. Organization			
8. Reading and Understanding			

**PREDOMINANT PROBLEM AREAS
ACCORDING TO DEGREE OF INADEQUACY**

Table 3

of the population. Three characteristics were chosen for investigation, a priori, based upon the researchers' perceptions of logical cause-effect relationships. The first characteristic was command. Was there a difference between the AFLC and AFSC responses? The second characteristic was the number of RIW programs the interviewee had worked with. Would this characteristic make a difference in their responses? The final characteristic was the amount of time the interviewee had been involved with RIW programs. Again, would this characteristic make a difference in the responses?

In order to form more of an opinion on whether these characteristics did make a difference, the population was segmented according to the characteristics, and individually tested. Again, each hypothesis was tested using three different criterion distributions which provided a measure of test sensitivity with the subcategories of the population being explored. The results of these tests are shown in Table 4.

To obtain an overview, it is interesting to note the total number of significant results for each subcategory. The test of AFLC personnel (n=13), indicated seven areas of significance (i.e., of inadequacy). The test of AFSC personnel (n=10), also indicated seven areas of significance. A comparison of program experience resulted in a different outcome. The test of personnel with experience in only one or two programs (n=12) indicated three areas of

significance, while the test of personnel with experience in three or more programs ($n=12$) indicated thirteen areas of significance. A final comparison was based on time experience with RIW. One category had only those personnel with three or less years of experience ($n=10$), while the other had only those with more than that amount ($n=14$). Here the difference was six areas of significance versus eleven areas of significance.

More detailed comparisons and observations are possible through a question by question analysis of the test results contained in Table 4. These observations can help clarify any underlying differences between the subcategories of the population, differences that may be reflected through the criterion distributions. Obviously, the degree to which the guidelines are found adequate or inadequate depends upon the criterion distribution selected. The observations drawn from a more detailed analysis of the test results presented in Table 4 should allow the reader to form an opinion on which criterion distribution is most appropriate. The results, given in terms of prob-values, are fairly self-explanatory. However, the conclusions drawn from the results, especially as regards selection of a criterion distribution, could be viewed as speculative. The researchers will comment upon the results of the tests between the subcategories and provide their conclusions in Chapter IV.

With this framework established, the results of the open ended

Q U E S T I O N	PROB-VALUE FOR TOTAL POPULATION VS CRITERION			PROB-VALUE FOR AFPC VS CRITERION			PROB-VALUE FOR LESS PROGRAM EXPERIENCE VS CRITERION			PROB-VALUE FOR MORE PROGRAM EXPERIENCE VS CRITERION			PROB-VALUE FOR LESS TIME EXPERIENCE VS CRITERION			PROB-VALUE FOR MORE TIME EXPERIENCE VS CRITERION		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1	.013	.096	.196	.046	.181	.228	.699	.824	.824	.249	.607	.847	.113	.443	.847	.400	.759	.759
2	.002	.020	.049	.046	.402	.478	.120	.208	.208	.518	.910	.996	.001	.024	.100	.055	.400	.400
3	.031	.185	.344	.125	.402	.478	.831	.973	.996	.518	.999	1.00	.040	.200	.518	.759	.988	.988
4	.005	.432	.785	.046	.870	.964	.319	.471	.471	.518	.999	1.00	.004	.162	.847	.055	.400	.759
5	.000	.000	.000	.001	.006	.009	.009	.022	.022	.010	.049	.100	.000	.001	.010	.015	.055	.055
6	.259	.998	1.00	.879	1.00	1.00	.664	.999	1.00	.996	1.00	.847	.124	.782	.996	1.00	1.00	.988
7	.002	.255	.551	.291	.972	.990	.009	.095	.628	.249	.999	1.00	.004	.162	.847	.055	.400	.759
8	.992	.744	.147	.998	.833	.713	.998	.959	.279	.814	1.00	.896	1.00	.928	.249	1.00	.759	.400
9	.001	.046	.102	.046	.402	.478	.037	.254	.471	.518	1.00	1.00	.000	.001	.010	.164	.759	.759
10	.005	.328	.551	.125	.972	.990	.037	.254	.471	.518	1.00	1.00	.004	.162	.518	.400	.988	1.00
	**14			**7			**7			**3			**13			**6		
	**11																	

* Significant at $\alpha = .10$

** Total number of significant results for each section

SUMMARY OF SENSITIVITIES AND POPULATION SEGMENTATION

Table 4

questions, which address perceived problem areas or areas that can be improved, are presented next.

Open Ended Response Question Results

Increased emphasis. The first open ended question asked whether the interviewees felt that any areas presently covered in the RIW guidelines should receive greater emphasis. Responses to this question indicated that a number of individuals had experienced problems which they felt might be avoided, if the pitfalls are emphasized.

Several individuals felt that the penalty clauses did not adequately penalize the contractor or provide relief to the Air Force in the event that additional spares are needed because of the contractor's failure to perform to contract specifications, e.g., the failure rate exceeds the specified MTBF (12; 15; 20; 33).

The MTBF guarantee is presented in the RIW guidelines as an option. Several of the interviewees felt that a MTBF guarantee is essential and that without it, RIW is simply a maintenance contract (11; 54).

The problem of unverified failures or retest OK (RTOK) is a recurring one, and some felt that additional emphasis is required in this area. This problem is compounded by the fact that the initial fault isolation is accomplished in many cases using test equipment supplied by the contractor (11; 12; 33). It was suggested that the

RTOK provision might be implemented gradually to allow for maturing of new equipment (33).

Another potential problem area is to adequately define the terms line replaceable unit (LRU), shop replaceable unit (SRU), and module in the contract, e.g., contract language must clearly state that any SRU, module, component not excluded in the contract will be included under the RIW provision of the contract.

As originally conceived, there were no exclusions under the failure free warranty. RIW as it has developed in the Air Force has a number of exclusions, but personnel interviewed felt that this is another area which should receive increased emphasis and that the exclusions should be held to an absolute minimum, e.g., crash, battle damage, acts of God (10; 11; 12; 22).

Although it might be taken for granted by many, several interviewees stressed that it is essential for the Air Force to meet its RIW obligations (15; 33).

Evaluation of candidates. Many individuals felt additional information was needed on application criteria used for selection of likely candidates for RIW. The criteria, as initially developed, were directed toward identification of items that would conform to the pattern of earlier successes achieved in the Navy under the failure-free warranty (the original RIW). Early applications of this concept were

used in relatively stable environments as marketing techniques by aggressive manufacturers who were pushing their products under the then new, total or life cycle cost concept (48).

The Air Force attempted to find candidates in existing systems for RIW at the ALCs in an effort to kick off their own program. After extensive review, the AFLC team tasked with identifying candidates failed to come up with even a single candidate. This occurred because the criteria proved too restrictive as a group. At this time, unwilling to abandon the concept, the emphasis was switched from use of RIW on existing systems to use with developing systems. However, existing criteria remained virtually "as is" in the guidelines with the caveat that all criteria need not be met for the technique to be used.

It is at this juncture that the need for more information is felt. Several felt there was no guidance on ranking the criteria to discern their relative importance (7; 29; 40). That is, if all criteria did not need to be met then which were the most important, and did this ranking change with different programs and circumstances? There was a range of opinion on how structured the guidance in this area should be. It was suggested that the guidelines should start trying to achieve a sophistication that would allow an ultimate model (24). This model would give a positive or negative response at the end of the process and would extend to all warranty concepts, not just RIW. Of those who commented, all felt a framework should be developed

to show how to go about setting up a ranking or algorithmic approach to candidate selection. Various approaches were suggested including a matrix, checklist and graphical technique (7; 12; 24).

Competition was seen by many as the key to negotiating a successful RIW contract, i.e., any negotiations after the source selection were certain to reduce the Air Force's potential benefits under the contract (10; 11; 15; 35).

Another suggestion indicated that there should be a methodology outlined for selection of the subsystems that should be considered as potential RIW candidates. For example, in a complex system like the F-16, there were approximately 300 subsystems that had to be considered as potential RIW candidates (12). Some type of screening technique was needed. One suggested method would use a logistics support cost model in conjunction with a sensitivity analysis. The Logistic Support Cost model could identify the cost drivers, i.e., items likely to cost the government a large amount of money over the systems life cycle. The costs identified in this way could be weighed against the costs of initiating and administering a RIW for that subsystem. In conjunction with the logistic support cost model use, the sensitivity analysis would be used.

With the suggestion for a framework also came the suggestion for more rationale behind the criteria, and what some of the effects of proceeding without meeting a criteria may be (7; 9; 11; 32; 35; 40).

This would allow the user to foresee some of the problems that may arise (or have already arisen from past experience) and to evaluate the importance for the item under evaluation. Because rationale and explanations were lacking the terms were too vague. For example, with the term "moderate to high initial support costs"--what is moderate to high? Or, what does the term, "cooperative attitude" on the part of contractors really mean? Further explanation for the criteria would help remove the vagueness (40).

It was also felt an additional criteria should be added. This criteria would address the importance of evaluating the relationship between the prime and subcontractor (10; 29). This criteria would become important when the prime had the contract and the subcontractor was doing the work.

Some felt the criteria that called for a 3 to 5 year period for the RIW was much too short (15; 20; 53). They felt a longer time period, e.g., would provide a more realistic incentive for the contractor to "grow" the reliability of the item.

Provisions. Almost all of the interviewees felt the guidance concerning the provisions that should be considered for inclusion in RIW clauses needed change. The main comment received throughout was that the lessons learned, and policy changes since the guidelines were first published in 1974, needed to be incorporated. One individual

felt the guidelines as a whole were of little value as presently written apart from historical purposes (48). These comments extended to the treatment of the provisions in the guidelines. It was felt that not only had the details of construction of the provisions changed, but also the whole concept of RIW had undergone an evolution. Other individuals agreed with the need to incorporate lessons learned and to fill in blank spots (7; 24; 29; 30; 40). Some felt much greater depth and detail were needed in the guidelines as a whole, with emphasis upon the provisions (29; 40). It was suggested that each provision needed to be explained in painstaking detail (40). A format was suggested in which a sample provision could be listed on one page while on the next facing page would be a line-by-line (word-by-word when necessary) explanation of the rationale behind the wording of the clause with comments on the effects of inclusion or omission of those key thoughts. Several individuals felt a single master or boiler plate clause could be written to incorporate the essential elements that needed to be considered (29; 40; 54). This single clause would be the only example needed. It was felt that having more than one example was only confusing to guideline users, because no rationale was provided for the differences. Others agreed that additional rationale behind the provisions needed to be supplied (32; 35).

Funding. Several individuals felt funding guidance in the guidelines

needed change (3; 18; 24; 29; 40; 48). All felt the guidance that had supplemented the initial guidance (policy letters and memorandum), needed to be included in the guidelines, i.e., it needed to be made current. One individual felt the guidance was inadequate, because it needed to be in a regulation (48). That is, by including this information, which is directive in nature, along with the other information which is currently non-directive a potential for confusion is created. Others felt that the guidance as currently stated was correct as regards fund type, but that it needed to be greatly expanded to include some of the troublesome issues that surround this area (15; 18; 29; 38; 40; 46). For example, the problems of budgeting before the decision to include a RIW as a part of the contract and of budgeting for all the considerations (support equipment, technical data, spare parts, etc.) of dropping the RIW and moving to organic support were very real to the personnel involved with RIW.

Costs and benefits. The main comment in the area of costs and benefits was that more information was needed. The greatest need was for more cost information (7; 9; 20; 29; 30; 32; 35; 40; 48). It was felt the treatment of costs was not comprehensive enough to be really helpful. There was no attempt to provide a list or outline of potential costs, especially some of the intangible costs that may not be obvious to a user without the experience gained from past programs. Also,

it was felt an attempt should be made to quantify or provide a method of quantification for some of the intangible costs to allow the analysis to be conducted more thoroughly (48). Without a complete treatment of the costs and benefits an accurate, trustworthy analysis could not be conducted.

There was a distinction drawn also between knowing what had to be considered and how to actually go about drawing a conclusion from the considerations. One individual felt some tools for analysis ought to be presented in the guidelines to at least let the user know there are ways already developed to analyze costs and benefits (7). One example given was a program developed for the TI 59 pocket calculator. Another example given was a recently completed analysis on a program for the B-52 offensive avionics system, which was written up and which, it was felt, would provide an excellent framework for analysis on other programs.

Administrative. The guidelines' treatment of the administrative considerations of using RIW received the most negative comments among the interviewees, of all areas addressed during the research. One individual stressed that the lack in this area was not an oversight of the original writers, but was a function of the limited knowledge available about this aspect of RIW (48). The information that was available at that time was included. He felt the area was totally

inadequate now and that the knowledge gained since the original publishing date should be included in the guidelines. These comments were characteristic of many others interviewed (7; 12; 16; 18; 20; 21; 24; 29; 32; 35; 38; 40). Currently, there is a large gap in this area. What is presented is very simplistic and does not respond to the needs of the users. What is needed is a comprehensive update, with all the information gained in the course of the past 5 years.

Logical flow. The problem of logical flow, although not addressed directly was addressed in terms of the format for presenting the information in the guidelines. One suggestion in this area was a reorganization of the guidelines around two main themes (24). The first theme was that the information presented in the guidelines should be tied to the phases of the acquisition life cycle. It was felt that the guidance would need to change depending upon the phase of the life cycle in which the RIW was introduced. For example, the guidance needed at the beginning of the full scale engineering development phase would be different from that needed during the demonstration and validation phase, or later in the production phase. This comment emphasized the amount of risk that would come into play and the amount of competition available. Both of these factors would change as the life cycle unfolded, and could play a very important part in determining whether a RIW would be appropriate, and if

appropriate, the specific structure of the RIW clauses. The second theme was that the information should be broken down by standard contract format. For example, section J of a contract always deals with special provisions under standard contract format. The guidelines, under this suggestion, should have a section entitled special provisions, in which all guidance pertaining to those provisions would be contained.

Another suggestion dealing with the format for the guidelines recommended three different volumes, which would form the complete guidelines when combined (54). Volume one would be an executive summary document which would provide an overview of RIW, policy guidance and general information. This would be similar to the present guidelines only without the examples. Volume two would be much more detailed and would explain how to implement and administer a RIW program. This section would explain how to decide on the level to which the RIW should be applied. It would explain the details of cost-benefit analysis--it would, in short, tell the how and why of RIW. Volume three would be a volume of case studies of actual past programs that would provide some of the pertinent detail of those programs.

Organization. Another suggestion indicated a section in which frequently asked questions were posed and answered would be helpful (24).

This section would give some rationale on why the question was asked, i.e., the implications of the question that may not be immediately obvious, or the situation from which the question generally (or specifically) has arisen.

It was also recommended that the guidelines needed to be extensively cross referenced with other documents (24). This would entail more than just a cite in a bibliography, but would also include comments on the background, scope and usefulness of the reference and how it could be used. The emphasis would be on providing a rationale behind the information presented so changes, additions or deletions could be made more confidently (i.e., with an awareness of the ramifications).

Two individuals felt the organization of the guidelines would be enhanced by including many more "how-to" type examples (32; 35).

One individual felt the organization was lacking because the treatment of areas as a whole was too general (40). The organization could lead to the impression that the subject of RIW only needed to be approached in a general way without much attention paid to the details. Detailed rationale was seen as a necessary part of good organization.

Reading and understanding. The majority of interviewees felt they had no trouble reading and understanding the guidelines.

Examples. Comments received indicated an increase in detail,

currency and number of examples was needed (32; 35).

Framework. The interviewees, as a whole, tended to disagree that the guidelines provided a framework for analysis of costs and benefits. Comments were put forth to improve this area in the guidelines in conjunction with question four, that dealt with identification of costs and benefits.

Other. Many individuals suggested the content of the guidelines should be formalized through inclusion in the Defense Acquisition Regulation (DAR) or in an Air Force regulation (7; 18; 24; 29; 48). There was some difference of opinion as to how much of the content should be formalized. The range went from abolishment of the pamphlet with all current guidance going into the DAR (11) to inclusion of the major policy areas in the DAR or Air Force regulation, while retaining some of the more detailed and "how to" information in a pamphlet similar to the present format (18; 48). One reason for a formalization of the guidance was to provide the authority needed to make current guidance stronger. Based upon lessons learned the guidance is (or should be) the best direction possible, and deviation from this guidance should be well supported. Presently the guidance is not current, and one possible reason updating has not been accomplished could be the lack of authority currently found in the guidelines. Another reason for formalizing the guidelines would be to ensure

their wide dissemination. The consensus of opinion among all interviewees was that the guidelines were not always readily available and in some cases (based upon personal experience) the guidelines had not even been heard of or seen despite the fact that they were published in July 1974. Formalizing the guidance through the DAR or through Air Force regulations would help extend the guidance and provide a greater assurance that those who wanted to review the guidance would find it easily available.

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

Overview

This chapter draws together the results discussed in Chapter III and shows how the research objectives established in Chapter I were met. The research objectives were to determine if the Air Force RIW guidelines are adequate and to obtain recommendations for improving those guidelines, if necessary. To meet those objectives, 24 individuals who are knowledgeable in the area of RIW were interviewed by the researchers. The interviews were designed to answer the questions of whether Air Force personnel involved in the contracting process perceive the RIW guidelines as adequate and what changes should be made to the RIW guidelines.

A conclusion of inadequacy for portions of the guidelines was made based upon hypothesis test of the scaled responses. These conclusions are prefaced by comments regarding differences between subcategories of the population and how these differences were reflected in the criterion distributions. The importance of the criterion distribution in determining the perceived adequacy or inadequacy of areas within the guidelines is stressed. Recommendations received during the open ended question portion of the interviews

address the inadequacies of the RIW guidelines and constitute the suggested changes to the guidelines.

Questions that did not fail the test represent areas that cannot be judged inadequate. However, in some cases recommendations were received which could improve these areas, notwithstanding their rating of adequate. Under these circumstances the recommendations were provided for consideration. Concise recommendations are presented which clearly address the main problems perceived by those in the field who are using the guidelines. A final section suggests areas for future research that appear to offer some potential for contribution.

Criterion Distribution

In Chapter III, observations were made concerning the subcategories of the population and how differences among the subcategories could be revealed through selection of the criterion distribution. For example, test of a hypothesis using a selected criterion distribution, based upon the population as a whole will yield a certain result. By segmenting the population according to some characteristic, and by testing each segment separately, using the same criterion distribution, the result may be different. If this is the case, it shows that a portion of the population felt differently, under the selected criterion, about the hypothesis being tested, but

their responses were lost through averaging with the responses of the other segments of the population. At this point, an evaluation must be made of the importance of the results received from the segment that felt differently. If the evaluator wants the differences to be revealed in a test of the whole population (because he considers them significant and does not want them to be lost), then a more discriminating criterion distribution would have to be used. This explanation concerning the criterion distributions is stressed, because a judgement of adequacy or inadequacy depends upon which criterion distribution is selected.

Referring to the population segmentation tests (see Table 4) the observations below present the researchers' interpretation of the results.

Comparison of results obtained with AFSC and AFLC indicated that although there are individual differences, overall, there does not appear to be much of a difference between these groups. Comparison of the two categories of program experience revealed a noticeable difference--those with more program experience saw the guidelines as much more inadequate, overall, than did those with less program experience. The final comparison was based on time experience with RIW. Here again there was a difference, but the difference was not as pronounced as the comparison between levels of program experience. This result leads to the observation that

program experience seems to be a greater influence than time experience in developing more discriminating attitudes.

As previously stated, the researchers developed criterion one to use in testing the interview results. If criterion two had been used, four less areas of the guidelines would have tested as inadequate. If criterion three had been used, two less areas than in criterion two would have tested as inadequate. Through segmentation of the population, and subcategory testing, some possible explanations for the differences between the distributions can be advanced. The reader can use this information to aid in his selection of the most appropriate criterion distribution.

Question three, dealing with funding guidance, was judged inadequate per criterion one but as adequate per criterion two and three. It is interesting to note that the subcategories of "AFSC," "less program experience" and "less time experience" did not test this question as inadequate while subcategories "AFLC," "more program experience" and "more time experience" did test the area as inadequate (see Table 4). The difference appears to be explained by lack of experience and being removed from the problem. AFSC is removed from the funding problems of obtaining spares, support equipment, technical data and of moving to organic support. This lack of hands on experience, along with general experience level could account for the difference in the area.

Question four, dealing with identification of costs and benefits, was similarly rejected as adequate with criterion one but not rejected with criterion two and three. Again, it is interesting to note that the subcategories of "less program experience" and "AFSC" failed to test this area as inadequate, while the other subcategories either did test the area as inadequate or were very close to testing the area as inadequate. A possible explanation could be that AFSC personnel are not really aware of all the downstream costs to the same degree as AFLC, because they are removed from the situation.

Question seven, dealing with the logical flow of the guidelines, was tested as inadequate via criterion one; adequate via criterion two and three. The subcategories of "AFLC" and "less program experience" failed to test this area as inadequate, while the others tested it inadequate. Experience, in terms of programs again is seen to be an important discriminator. Why this difference did not show up under "less time experience" is unknown. Why "AFLC" tested differently than the other categories is subject to speculation. However, one explanation could be that AFLC, not normally involved in the selection and evaluation of candidates, has less need for a document that logically flows through the various areas of consideration. That is especially true, since the guidelines were written mainly for application during the early stages of a program (AFSC being the primary command at that point).

Question ten, dealing with the framework provided in the guidelines for cost-benefit analysis, was tested as inadequate via criterion one, but adequate via criterion two and three. For this test, experience in terms of both programs and time appeared to be the explanation for the difference in results. The other subcategories either tested the area as inadequate or were very close to doing so (Table 4).

Conclusions

Based upon the analysis of results presented in Chapter III, the guidelines have several areas of inadequacy. This conclusion is based on the tested perceptions of users in the field, who are knowledgeable of the RIW concept and who have worked with RIW programs. Table 5 summarizes those areas (Table 5 is the same as Table 3).

Recommendations

Based upon the interviews, there are areas in the guidelines that need to be especially emphasized, because experience has shown that problems seem prone to arise in these areas. As mentioned in Chapter III, the areas of penalty clauses, MTBF guarantees, RTOKs, failure definition, level definition, exclusions, government obligations and need for competition all need to be addressed. These problems are characteristic of the many problems that will occur, in various forms, from program to program. The researchers feel the best way to emphasize an area is to provide a large measure of the rationale

Question	Inadequate	under	Criterion:
# Area	1	2	3
2. Provisions	X	X	X
5. Administration	X	X	X
1. Evaluation of Candidates	X	X	
9. Examples	X	X	
3. Funding	X		
4. Identification of Costs and Benefits	X		
7. Logical Flow of Information	X		
10. Framework for Cost-Benefit Analysis	X		
6. Organization			
8. Reading and Understanding			

SUMMARY OF CONCLUSIONS

Table 5

behind why that area is important and how various changes in the area will impact the program. Illustration of how this recommendation can be applied will address another problem area brought out through the interviews--that of the examples and contract provisions currently in the guidelines. The suggestion is to develop one comprehensive example clause which contains all the appropriate contract provisions. The provisions now in the guidelines are out of date and consequently have blank spots and misleading sections. Before emphasis can be meaningfully applied to the provisions, they should be brought up to date. A suggested format would have the clause listed down one side of the page with the rationale on a facing page. The clause would be explained line by line, or phrase by phrase, in great detail. Only one example clause is suggested, because more than one example clause may lead to confusion. Detailed rationale would allow modification of the provisions of the one example, as needed, and would provide the emphasis required to avoid the pitfalls experienced in the past.

Another major problem area centered around the identification of costs, and development of an analysis framework to weigh the economic costs and benefits of a RIW application. The first suggestion is to completely identify all costs by means of a checklist. The idea of a checklist may be viewed as too simplistic, but experience has shown it is very easy to overlook areas, until it is too late to take

them into account. The list should include statements of the intangible as well as tangible costs of a RIW. The intangible may be extremely difficult to quantify, but the first step toward quantification and measurement of these costs is to acknowledge their existence, label them, and start to work with them. The second suggestion is to provide several examples of how to analyze the costs and benefits. Detailed examples with rationale behind the components of the analysis model or technique should help provide the proper emphasis and framework for effective use.

Selection of candidates is another area that needs to be improved. The main suggestion here is to provide some means of ranking the criteria, i.e., of determining the relative importance of the criteria. Perhaps this could be accomplished through development of an algorithmic/flowchart approach. The other main suggestion should aid in accomplishing the first suggestion. This suggestion is to provide the rationale behind the criteria, with statements of probable impact for each criteria when it is not met. Provided this background, a user can examine his own program and more easily determine the relative importance of the criteria.

The guidelines' treatment of administrative functions and considerations is inadequate. The inadequacy is due to the fact that much has been learned in this area, since the guidelines were published. What was adequate then, no longer is adequate. The recommendation

here is simple--update the section with current policy and procedure. The section in the guidelines should provide a complete list of administrative functions and considerations, include the rationale of why the functions are important, and explain some of the possible pitfalls surrounding the functions. In this area, as in the previous area, rationale is the key thought.

Funding guidance is another area that has been supplemented and changed since publication, but the changes have not been entered into the guidelines. Changes and supplements should be incorporated into the section to make it current. This section can be improved by an expansion of the material into what could be termed, financial management. Guidance on planning and budgeting for spares, support equipment, technical data and for transition costs of moving from a RIW to organic support should be provided. Per the interviews, this area has been a very confusing and changing area which should receive more structure and detail.

The organization of the guidelines can be improved through addition of more information. Several additions are suggested as ways of making the guidelines more responsive to the user's needs. An annotated bibliography should be provided as a reference source for users who want a variety of viewpoints and a broader background of the RIW technique and its applications. A section listing points of contact for RIW programs, past and present, should be included as

a user resource. A section on analysis models should be presented for the user's review. A section with frequently asked questions and appropriate answers should be provided to amplify important areas.

The logical flow of the guidelines can be improved by changing the format of the guidelines. The guidelines should consist of three volumes. The first volume would be statements of general policy or an executive summary. It would provide an overview of RIW, and general information and policy. Volume two would be the detailed "how to" volume in which information on analysis, implementation and administration would be provided. Volume three would be a collection of case studies, additional information such as the annotated bibliography mentioned earlier, and other helpful guidance. All three volumes, especially volumes one and two, should stress the relationship of the user's actions, and acquisition life cycle, and other life cycle cost techniques.

In order to assure ready availability of current RIW guidance, and especially to provide more authority to the guidance which has been accepted as valid, the guidelines should be formalized through inclusion into the Defense Acquisition Regulation (DAR).

A summary of the recommendations is contained, in abbreviated form, in Table 6.

<p>ELEMENTS TO CONSIDER IN CHOOSING CANDIDATES FOR RIW</p> <ol style="list-style-type: none"> 1. Rank criteria according to relative importance. 2. Construct a screening procedure such as a checklist, algorithm or matrix.
<p>PROVISIONS NORMALLY INCLUDED IN RIW CLAUSES</p> <ol style="list-style-type: none"> 3. Develop a current example that includes all relevant provisions. This example should be fully explained, so a user could understand the ramifications of any changes to the basic example.
<p>TYPES OF FUNDS TO BE USED FOR RIW CONTRACTS</p> <ol style="list-style-type: none"> 4. Publish all pertinent policy guidance in appropriate regulations. 5. Develop a method to initially budget for RIW and its alternatives. 6. Develop a timetable (planning) to budget for transition from RIW to organic support.
<p>POTENTIAL COSTS AND BENEFITS TO BE DERIVED FROM A RIW</p> <ol style="list-style-type: none"> 7. Identify all relevant costs and benefits and incorporate them in a checklist. 8. Develop a model and "how to" examples.
<p>ADMINISTERING CONTRACTS INCORPORATING RIW</p> <ol style="list-style-type: none"> 9. Identify all relevant RIW administrative functions. 10. Ensure all information provided is current.
<p>ORGANIZATION OF THE RIW GUIDELINES</p> <ol style="list-style-type: none"> 11. Develop an annotated bibliography. 12. Include points of contact. 13. Compile a list of frequently asked questions and answers. 14. Incorporate a chapter on cost evaluation models.
<p>LOGICAL FLOW THROUGH ALL RELEVANT CONSIDERATIONS</p> <ol style="list-style-type: none"> 15. Tie the guidelines to the phases of the acquisition life cycle. 16. Divide the guidelines into three volumes: basic policy, detailed "how to" information, and case studies.
<p>EXAMPLES OF HOW TO WRITE RIW CLAUSES</p> <ol style="list-style-type: none"> 17. See recommendation 3 above.
<p>OTHER</p> <ol style="list-style-type: none"> 18. Incorporate RIW guidance into the Defense Acquisition Regulation. 19. Change the DAR as required to keep people in the field abreast of the latest lessons learned, procedural modifications, and policy changes.

SUMMARY OF RECOMMENDATIONS

Table 6

Recommendations for Further Research

The researchers believe the following RIW-related subjects offer significant potential for future research efforts:

1. Completed and active RIW contracts should be analyzed to determine whether RIW is an effective contracting technique. AFLC headquarters is currently the repository of all RIW information previously contained in the ARINC operated Warranty Information Center. The information available should provide a useable data base for evaluation of the RIW concept. Alternatively, a methodology could be developed for evaluation of the data as a first step.

2. Researchers should explore development of new models or testing of existing models to be used in determining the cost effectiveness of a RIW candidate.

3. A decision tree or algorithm to evaluate the applicability of a RIW candidate should be developed.

4. Evaluation of why contractor initiated, no-cost to the government, ECPs have not been used as much as expected to achieve greater reliability growth during the warranty period should be accomplished. With this evaluation should be an exploration of ways to increase contractor effort in this area. For example, one suggestion received during research was for the Air Force to share the cost of the ECPs or to use value engineering clauses to incentivize reliability growth, if the contract was more than 50% complete or if

the MTBF target had been exceeded (29). Along these lines, are significant changes being made which are not within the scope of the ECP and configuration control programs?

5. The RIW concept has been a trial concept for over five years and data is being collected to evaluate the cost effectiveness of the technique. Comments received during research indicated data requirements for RIW programs may be excessive (30). That is, the government is paying for data it may not use. This is because, some speculate, the concept probably never really can be evaluated. The research would evaluate present data requirements on a cost-benefit basis.

6. Section 1-324 of the DAR, which deals with warranties, should be reviewed to evaluate the section's effectiveness in providing guidance on how to consider various warranties. Development of a go-no go type model is contemplated. One individual contacted during research felt what to consider was adequately covered in the DAR but rationale wasn't provided on how to consider warranties (24). It was felt that if a RIW was being considered, the RIW must be considered within the context of warranties in general. Since the DAR is the basic guidance used by contracting personnel, it was felt the DAR must provide a reasoned path through all the warranty concepts with RIW as one of the possible outcomes. If RIW was the outcome of the review, the specific RIW application criteria would be reviewed for a

decision on whether or not to use RIW.

7. When failure of an item is due to a cause which excludes it from repair under the terms of the RIW contract, its repair comes under a separate contract at additional cost to the government. It is suggested that the cost of RIW, with only battle damage and Acts of God excluded, be investigated for cost effectiveness as compared to the present practice of having a separate repair contract for a larger number of exclusions, e.g., induced failures, transportation damage, unauthorized maintenance, etc.

8. To date there have been few applications of RIW to mechanical equipment. Such items represent a potentially beneficial area for RIW application. Future researchers should determine the reason that RIW has not been applied to more mechanical items. Additionally, a strategy or methodology should be developed to ensure that mechanical items are included in future evaluations of RIW candidates.

9. Future researchers should explore whether the length of the production phase has any effect of the effectiveness of the RIW. It is conceivable that a longer production run would lead to an increased number of ECPs, thereby improving reliability.

APPENDIX

INTERVIEW GUIDE

Introduction

As was indicated in our initial contact with you, we are students in the AFIT School of Systems and Logistics. Our thesis work is in the area of the Reliability Improvement Warranty. We are attempting to assess the perceived adequacy of the RIW guidelines, incorporating lessons learned.

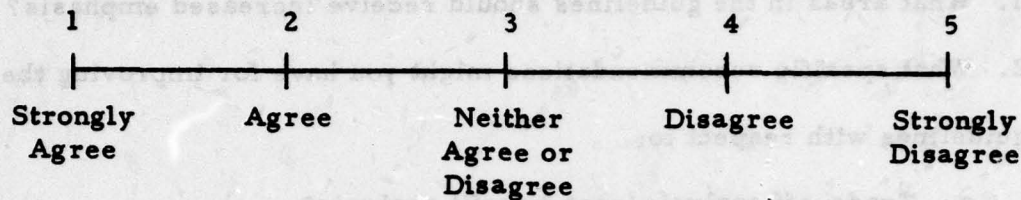
In answering the questions, we would ask you to relate to the current guidelines, i.e., the interim Air Force Reliability Improvement Warranty Guidelines, referenced in the AFLC and AFSC supplements to the Defense Acquisition Regulation.

There are three types of questions. The first ten questions are designed to be answered by indicating how much you agree with a statement concerning the RIW guidelines, rated on a five point scale. We realize your answer will normally represent a weighted average or a mental balance of the conflicting factors within the answer. But, in order to make sure we accomplish this portion we ask that you reserve your comments concerning the rationale behind your answer until the second portion of the interview. In the second portion, we will ask seven open ended questions to obtain your comments and insights. At this time we would welcome elaboration on problem

areas brought to mind in the first section. Finally, we will ask four classification questions to help us analyze the results of our interviews.

We would like to tape record the interview, to avoid the possibility of missing some valuable comment while trying to take notes. However, if you would rather not be recorded, we will not record.

The following scale will be used for questions 1-10:



COMPLETE

1. The guidelines contain sufficient information on the essential elements to consider in choosing appropriate candidates for RIW.
2. The guidelines contain sufficient information concerning the provisions that should normally be considered for inclusion in RIW clauses.
3. The guidelines are sufficiently detailed to permit a determination regarding the types of funds to be used for contracts incorporating RIW.
4. The guidelines provide a sufficient treatment of the potential costs and benefits (both tangible and intangible) to be derived from a RIW.
5. The guidelines provide sufficient information concerning the establishment of efficient and effective procedures for administering contracts incorporating RIW (including records and reports).

HELPFUL

6. The guidelines are well organized, i.e., material on specific issues is easily located.
7. The guidelines are constructed in such a way that they encourage a logical flow through all relevant considerations in the RIW issues.
8. I have no trouble reading and understanding the guidelines.
9. I find the examples in the guidelines on how to write RIW clauses particularly helpful.
10. The guidelines provide a helpful framework for analyzing the costs and benefits associated with a potential RIW.

CHANGES

1. What areas in the guidelines should receive increased emphasis?
2. What specific recommendations might you have for improving the guidelines with respect to:
 - a. Trade-off analysis/cost-benefit analysis?
 - b. Administrative procedures?
 - c. Funding?
 - d. Construction/organization of the guidelines?
 - e. Examples provided?
 - f. Other?

CLASSIFICATION

1. Command
2. Number of RIW programs involved with
3. Length of time involved with RIW type programs
4. Grade or rank

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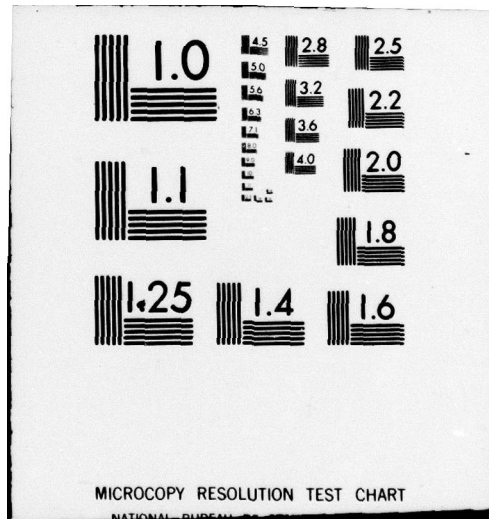
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